The troubles with pinkies

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In my personal series of 3006 children with congenital hand abnormalities, the most common defect was extra digits (528 cases), next was webbed fingers (429 cases), and third was abnormalities of the little finger (354 cases).

Any of the digits of a newborn may show deviations in alignment to the palm. However, it is the ulnar side of the hand, and usually the little finger, that most commonly shows skeletal and soft tissue changes. The fifth digit, affectionately known in North America as a *pinkie* (probably from the Dutch *pinkje*), is quite often in trouble in the sense that it may be permanently flexed at its proximal interphalangeal joint or may be deviated laterally to one side or the other at either interphalangeal joint.

Clinically, a bending or curvature of the finger in the plane of the palm is described as *clinodactyly,* a word derived from the Greek *kliner,* "to bend," and *dactylos,* "a finger." A flexion deformity at the proximal interphalangeal joint is known as *camptodactyly* from the Greek "bent finger." Only rarely do both abnormalities occur at the distal interphalangeal joint, a deformity first described by J. Kirner in 1927 and now named after him.

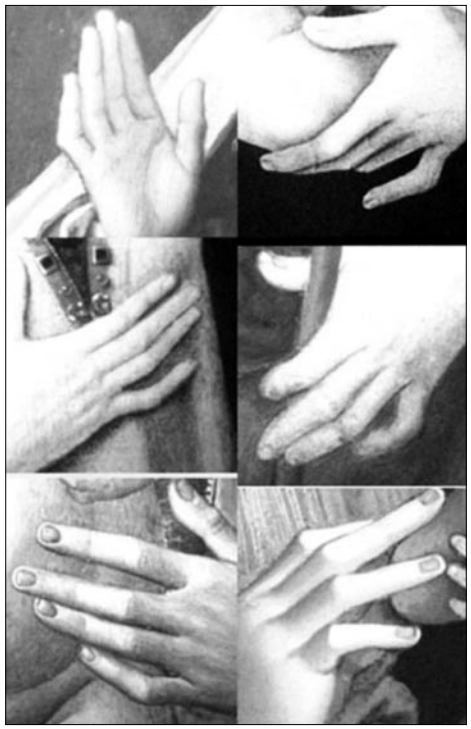

Figure 1. Camptodactyly seen in six different Renaissance artists' paintings in the Metropolitan Museum of Art in New York City. These bent fingers were probably not pathological but simply following the fashion of the time. Reprinted with permission from reference 2.

There is an enormous lay literature concerning our little fingers, with discussions varying from palm reading to the works of 15th-century Dutch artists (1, 2) *(Figure 1)*. In *Cheiro's Language of the Hand,* the little finger, when well shaped and long, is said to indicate the power of the subject to influence others. When very long, it shows great power of expression in both writing and speaking; its owner is more or less the savant and philosopher (3). Fred Gettings, in his illustrated history of palmistry (4), reports that "when the little finger is quite obviously isolated from the others a difficulty in relationships must be immediately suspected." If, in addition, there is a large, well-developed mount of Venus and a deeply marked long or broken girdle of Venus, then one can be certain that the root problem is too great a preoccupation with sex. If the little finger is long because the first phalanx is very well developed, it will, according to the old traditions, indicate a love of knowledge and of education. A square ending to the little finger "adds a love of research and logic to his oratory." An extended survey of my colleagues' hands in the hospital lunchroom does not seem to agree with these observations!

In the last decade, two physicians have published erudite books, both titled *The Hand*. One was written by Frank Wilson, a neurologist and the director of the Health Program for Performing Artists at the University of California School of Medicine in San Francisco (5). He describes how fossil records show that sometime after Lucy (the bones discovered by Dr. Donald C. Johanson and named "Lucy" based on the Beatles' song playing at the time), the basal joint of the fifth metacarpal developed mobility, allowing the little finger border of the hand to move towards the palm, creating with the thumb a cupping of the palm. Lucy is thought to have lived 3 to 4 million years ago, but no fossil specimens have yet been recovered to more accurately date this significant change in hand structure.

In modern hands, the little finger has 40 degrees of motion towards the palm, accompanied by 20 degrees of similar motion of the ring finger metacarpal. The index and long finger metacarpals do not move and are the central pillar around which the thumb and ulnar fingers move towards each other.

The other book titled *The Hand* was written by Raymond Tallis, a professor of geriatric medicine at the University of

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The second half of this article is an updated and abbreviated form of part of chapter 10, "Crooked Fingers," in Flatt AE. *The Care of Congenital Hand Anomalies,* 2nd ed. St. Louis, MO: Quality Medical Publishing, Inc., 1994. Figures 3 through 8 were originally published in that chapter and are reproduced with permission.

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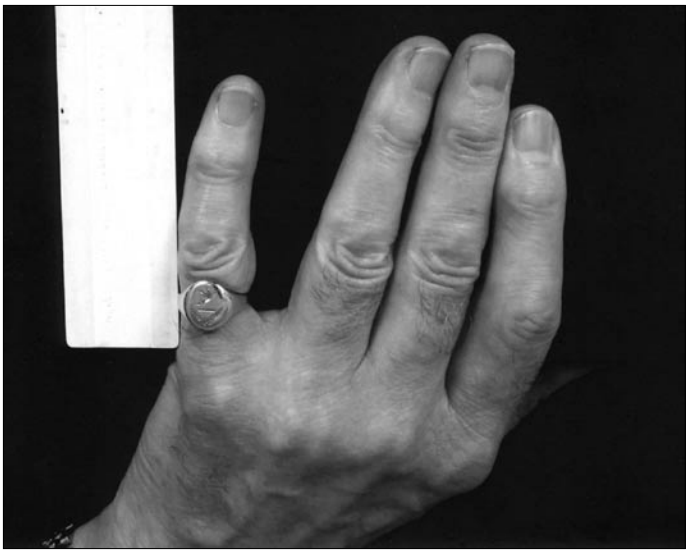

Figure 2. My own left little finger, demonstrating what I insist is a "normal" clinodactyly and the British placement of family signet rings.

Manchester, England. He described the book as a "philosophical inquiry into human being" (6). His section on the little finger begins: "About the little finger there is little or nothing to be said. This is the little or nothing. End of Portrait. No, just wait one moment. . . ." He then spends a whole page describing how when he was a boy there was much talk of the "U" and the "non-U." There were U and non-U ways of comporting oneself, especially in important social rituals such as drinking tea. The manner in which one held a teacup was a crucial marker of social position. To be "U," the little finger should never touch the handle of the teacup; it should be "well free of the other fingers, waving in a space beyond the angle between cup and handle." This grip is rather awkward, and the freely waving little finger is conspicuous and clearly "U"!

Equally "U" is the British male's habit of wearing the family crest ring on the little finger and not the appropriately named adjacent digit *(Figure 2)*.

Walter Sorell, when a faculty member of Columbia University in 1967, published his book, *The Story of the Human Hand* (7). His chapter on fingers and their positions has a different viewpoint. He states: "The elevated little finger bespeaks a deeply imbedded wish to distinguish oneself from others; it occurs in both male and female hands. In its allegorical translation, it is a finger which desires to be remarkable and pretends not to have anything to do with the other fingers. Since this gesture can be observed among both the poor and the rich, it is no criterion of social class."

Enough of this nonsense and on to sterner stuff.

There is an equally large clinical literature about our little fingers, which unfortunately does not boil down to a single definitive cause for either clinodactyly or camptodactyly.

CLINODACTYLY

Clinodactyly is described as an angulation at an interphalangeal joint in the radio-ulnar or palmar planes. Burke (8), in a useful paper, stresses that clinodactyly is a physical sign and not a disease. It is caused by various alterations in growth of the phalanx proximal to the angulation. One significant problem is what degree of angulation justifies the diagnosis. Minor degrees of curvature of the small finger are so common as to be considered normal; at least I certainly think so since both of my small fingers show at least 10 degrees of radial inclination (Figure 2).

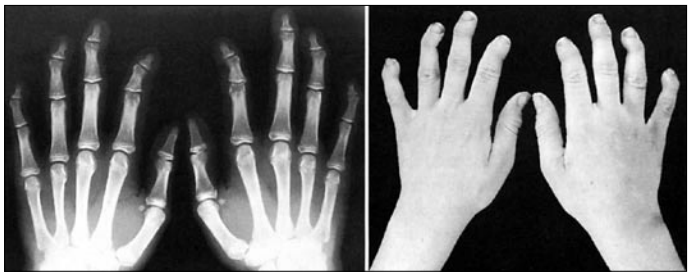

Figure 3. Frostbite clinodactyly. In northern climates, subclinical frostbite in children's hands is not uncommon but is frequently misdiagnosed. Irregular and premature closure of the distal phalanx epiphysis is sometimes accompanied by middle phalangeal closure, as in both index fingers.

Reports of incidence vary between 1% and 19.5%, no doubt depending on the zeal of the examiner. Clinodactyly certainly runs in families and probably depends on an autosomal dominant gene. It is associated with at least 60 syndromes, of which Down's syndrome is the most common: 35% to 79% of people with Down's syndrome have clinodactyly. The large number of associated syndromes demands that a thorough physical examination be done before any question of treatment arises.

The root cause for the condition is an alteration of alignment of the joint surfaces of either interphalangeal joint away from their normal 90 degrees to the long line of the digit.

Burke has subdivided clinodactyly into four categories:

1. Familial with a dominant inheritance not usually associated with other abnormalities.
2. Associated with other congenital abnormalities, as in the 60 or more syndromes.
3. Involving injuries to the growth plate, physical or thermal, most commonly juvenile rheumatoid disease and, in northern climates, frostbite *(Figure 3)*.
4. In a thumb with three phalanges.

There is no urgency in treatment of the newborn; a complete physical examination and x-rays will define the situation. Unless the deformity is gross, watchful waiting is the best immediate treatment. Splinting has been tried by many and routinely does not correct the deformity. If the deformity increases with growth, surgical correction is the only reasonable treatment.

When should surgery be done? Significant overlapping of the bent finger is an obvious indication. A longitudinal epiphyseal bracket as seen on x-ray can only lead to gross deformity if left uncorrected.

Several surgical alternatives are available. In the finger in which the more proximal phalanx is curved, a closing wedge osteotomy on the convex side is the operation of choice.

I rarely operate on overlapping fingers, despite parents' desires, unless the finger overlaps on fist making. This overlap deprives the hand of the valuable ulnar border locking of grasp provided by the most ulnar digit.

Technically, a closing wedge osteotomy is not hard to do and is the best operation for children with a clinodactyly of about 45 to 50 degrees. It can usually be postponed until around the age of 4 *(Figure 4)*.

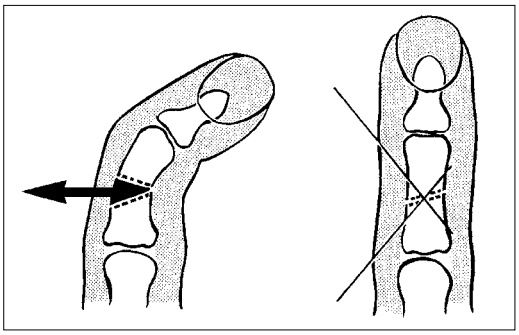

Figure 4. A closing wedge osteotomy, taken from the convex side and stabilized with two Kirschner wires for 4 to 6 weeks.

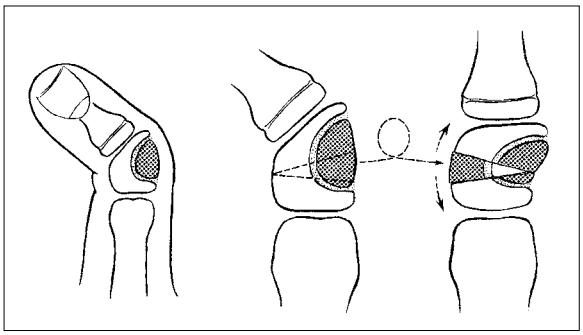

Figure 6. Reversed wedge osteotomy. This operation is sometimes technically difficult, but it does straighten the finger and maintain the maximum possible length.

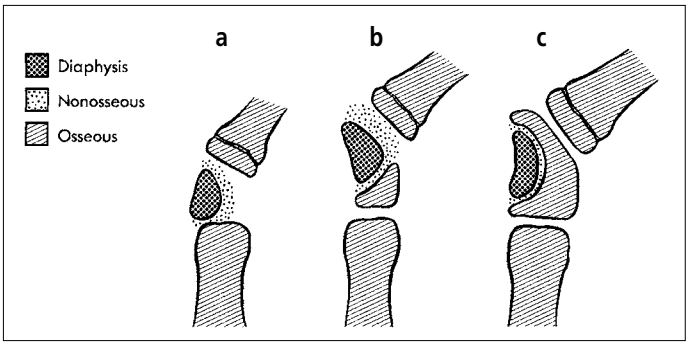

Figure 5. Three stages in the development of a longitudinally bracketed diaphysis. **(a)** The longitudinally epiphyseal bracket is entirely cartilaginous at 7 months of age. **(b)** Proximal and distal ossification centers begin to appear in the bracket at 19 months. **(c)** At 8 years, the bony part of the bracket is still separated from the diaphysis by residual nonosseous tissue.

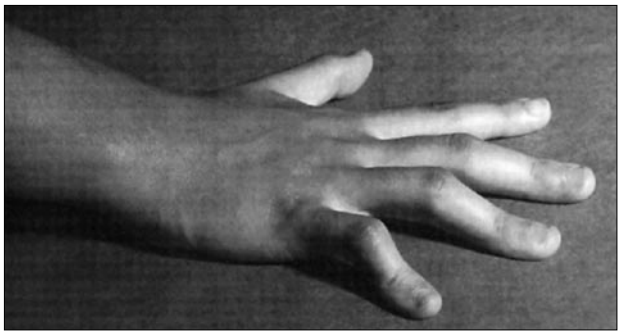

Figure 7. Camptodactyly. Occasionally more than the small finger is involved. In such cases, the extent of the flexion contracture decreases toward the radial side of the hand.

A longitudinal epiphyseal bracket *(Figure 5)* is an abnormality because instead of its normal transverse position it lies alongside its phalanx in a proximal to distal direction. It is usually C shaped rather than straight and commonly lies on the shorter side of the abnormal bone. Longitudinal growth is impossible and progressive angulation inevitable.

In 1981, Light and Ogden (9) named this condition "longitudinal epiphyseal bracket" and published their views on its surgical correction. Their report shows that early division of the bracket has caused premature closure of the epiphysis after osteotomy. If the angulation is not compromising hand function, osteotomy should be delayed. When function is compromised, osteotomy must be done as soon as the bracket shape is well defined and is judged large enough for effective surgery.

There are two ways of achieving lengthening after the longitudinal bracket has been cut and the underlying epiphysis has been destroyed. An opening wedge osteotomy can be done with bone from a distance packed into the open space. I prefer to base a wedge osteotomy on the longer side of the phalanx, remove and reverse the wedge, and insert it on the shorter side *(Figure 6)*. Technically, it is not easy to remove the wedge. A power saw should not be used, since it removes length; the best way to define the wedge is to patiently peck away with the tips of a small sharp bone cutter. The tips of the bone cutter should gradually score a deeper and deeper groove in the cortical bone. The wedge is held in its new site with a fine Kirschner wire passed from the finger tip through the center of both distal and proximal epiphyses into the head of the proximal phalanx. The wire should protrude from the tip of the finger and be removed in about 6 weeks. For long-standing clinodactyly or clinodactyly >50 degrees, additional soft tissue procedures may be necessary. Such procedures include release of skin or deeper structures, relocation of extensor tendons, and advancement of collateral ligaments.

CAMPTODACTYLY

In contrast to clinodactyly, camptodactyly has a voluminous literature regarding both its cause and treatment. Multiple etiologies are described, and consequently many operations have been suggested.

Camptodactyly is a nontraumatic flexion contracture of the proximal interphalangeal joint of the little finger with occasional additional involvement of one or more adjacent fingers. It usually occurs sporadically but when familial has a dominant autosomal pattern *(Figure 7)*.

The etiological puzzle has a number of proponents, and there is no unanimity as to its cause or treatment. Smith and Kaplan (10) have stated that virtually every structure about the base of the finger has been implicated. A thorough discussion of this problem has been published by Burke (11). There seem to be two types of camptodactyly: one that appears in infancy and affects both sexes, and the other, probably less common, which occurs in adolescent females. The flexion contracture varies from very mild to over 90 degrees and may progress particularly during the adolescent growth period or remain unchanged for years.

Engber and Flatt published a study of 110 hands in 66 patients treated at the University of Iowa (12). Thirty-two patients had been treated nonoperatively, and only 20% showed any improvement. Corrective surgery of various types resulted in improvement

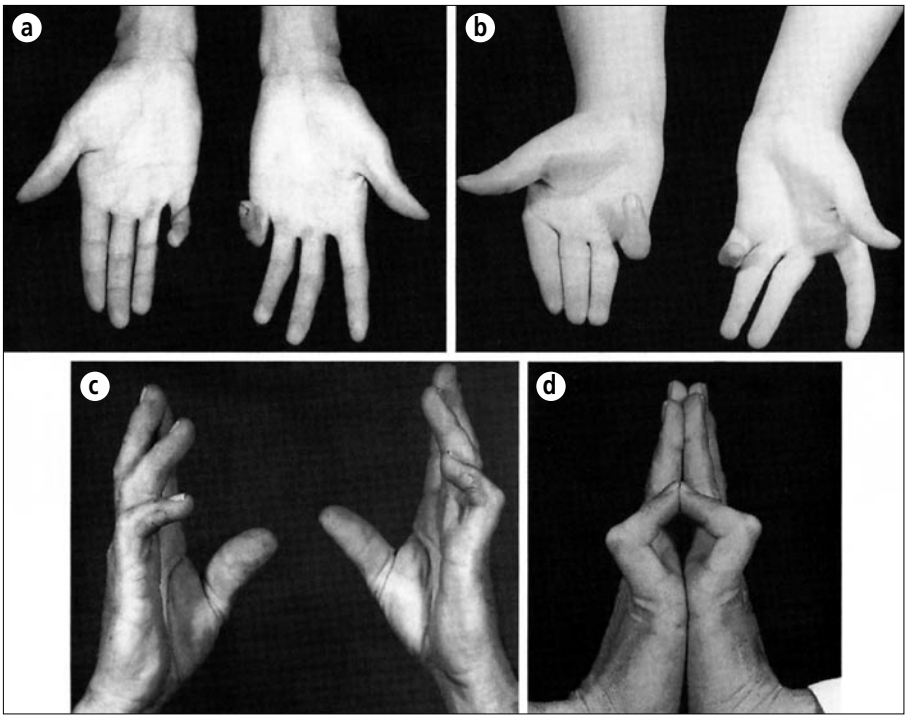

Figure 8. Severe camptodactyly. There may be little functional deficit even in severe deformity. **(a)** A teenage boy who "had a little trouble with baseball." **(b)** A teenage girl who had difficulty learning to type. **(c)** A farmer and **(d)** a professor of surgery, neither of whom admitted to any difficulty on using their hands.

in only 35%. This review was done 30 years ago, and results today are not significantly better.

A great variety of abnormalities have been suggested: an imbalance between flexor and extensor forces, abnormal insertions or strength of the lumbrical muscle, shortening and thickening of the collateral ligaments, anomalous flexor digitorum superficialis or profundus, faulty development of the dorsal extensor aponeurosis, and malformations of the retinaculum cutis in the palmar fascia and natatory ligaments (13). These multiple causes show that there can be no single operative "cure." The vital decision is whether or not surgical interference is justified. I am impressed by the number of patients who, despite marked contractures, have adapted to their problem and deny being handicapped *(Figure 8)*.

Treatment by splinting is of no avail; even many months of such immobilization with persevering parents make no significant difference. Shortage of palmar skin is secondary to the underlying cause(s), and skin lengthening procedures alone are pointless.

Exploration on the flexor aspect using a longitudinal midline incision as recommended by McFarlane et al (14) will usually disclose abnormalities of the lumbrical or its insertion. After any anomaly has been released, they recommend a transfer of the fourth superficialis flexor tendon into the extensor mechanism. If there is a residual joint contracture of more than 30 degrees a soft tissue release of the proximal interphalangeal joint should be done. The longitudinal skin incision should be closed by Z-plasties. An extension splint should be used at night for 3 to 6 months with decreasing daylight use.

The small finger superficialis tendon is not always suitable for transfer, and transfer of the extensor indicis proprius as used by Gupta and Burke (11) strengthens extension of the proximal interphalangeal joint. The tendon is passed through the intrinsic between the fourth and fifth metacarpal through the lumbrical canal palmar to the intermetacarpal ligament and attached to the dorsal central slip. Thus, this transfer aids flexion of the metacarpophalangeal joint and extension of the proximal interphalangeal joint.

John Hunter, the father of English surgery (1728–1793), was known as the reluctant surgeon. He stressed in all his teachings that surgery was always the last resort of treatment. Several centuries later, there is still a place for his teachings, and in these two conditions I am one of his disciples.

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